Castles Mountain Restoration Project

Botany Report

Prepared by:
Justina Dumont
Botanist

for:
Belt Creek – White Sulphur Springs Ranger District
Helena-Lewis & Clark National Forest

December 10, 2018

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Introduction

This report discusses the affected environment and the environmental consequences of the proposed alternatives in the Castles Mountain Restoration project area on botanical resources. There are no federally-listed threatened, endangered or proposed plant species known to occur on the Lewis and Clark National Forest (USDI Fish and Wildlife Service 2018), therefore this report will be limited to region 1 (R1) sensitive species and their habitats.

Relevant Laws, Regulations, and Policy

Regulatory Framework

Management areas contained within the proposed project area are listed below with corresponding management goals.

Table 1: Applicable Lewis and Clark National Forest Management Areas

Management Area	Acres (All Ownership)	Acres (Forest Service)	Management Goals
Management Area C	18764	18446.4	Maintain enhance existing elk habitat by maximizing habitat effectiveness as a primary mgmt. objective. Emphasis toward mgmt. for habitat diversity. Commodity resource mgmt. practiced where compatible with wildlife mgmt. objectives.
Management Area D	19874.7	17942.7	Provide sustained high level of forage production for livestock while protecting, maintaining, improving water, wildlife and other resources
Management Area E	15757.2	11005.7	Provide sustained high level of forage for livestock and big game animals.
Management Area G	15075.7	13571.3	Maintain and protect Forest resources with minimal investment.
Management Area H	1981.9	1673.9	Provide winter recreation opportunities supported by public and private developments while maintaining other resource values.
Management Area J	4809.2	4759.9	Water quality for municipal use
Management Area L	3596	2204.7	Mineral, exploration, development, production while protecting historical values
Management Area R	N/A	N/A	Manage to protect or enhance unique ecosystem values associated with riparian zones. Give preferential consideration to riparian area dependent resources. Timber and range management activities are permitted.

Desired Conditions:

Management standards from the Lewis and Clark Forest Plan that apply to sensitive plants include:

- Standard C-2 (1): Comply with the Endangered Species Act, other related laws, executive orders, Forest Service Manual direction, implementing regulations of the National Forest Management Act, legal decisions that have a bearing on the Forest Service T&E species program, consultation with the US Fish and Wildlife Service, recovery plans, and special studies.
- Standard C-2 (2): Conduct a biological evaluation of each program or activity which is Forest Service funded, authorized, or carried out on occupied T&E species and sensitive species habitat.

This evaluation will determine whether or not informal or formal consultation with the US Fish and Wildlife Service on Threatened and Endangered species is appropriate.

- Standard C-2 (3): Identify and evaluate cumulative effects as part of each biological evaluation. This evaluation may result in specific management recommendations in addition to those identified above.
- Standard C-2 (13): There are sensitive plants, as listed by the Regional Forester, of limited distribution that occur on the Forest and may require special consideration in land management to maintain diversity within the species gene pool. Assessments of suitable habitats for sensitive plants will be conducted before surface disturbing activities are permitted.

The following laws, regulations, and policies also apply to proposed activities within the project area including:

- Forest Service Manual FSM 2670.32 (1): Review programs and activities as part of the National Environmental Policy Act of 1969 process through a biological evaluation to determine their potential effect on sensitive species.
- Forest Service Manual FSM 2670.32 (2): Avoid or minimize impacts to species whose viability has been identified as a concern.
- Forest Service Manual FSM 2670.32 (3): Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
- Forest Service Manual FSM 2672.41: Ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to trends toward Federal listing of any species.

Topics and Issues Addressed in This Analysis

Purpose and Need

The purpose of the project is to move the Castles Mountains toward a more resilient forest and grassland ecosystem that will address the departure in fire regime condition class to reduce the future threat of high intensity wildfire and the associated hazards to the public, fire suppression resources, valued structures and community infrastructure such as power corridors and the Willow Creek municipal watershed. In order to achieve this, there is a need to restore to a more mosaic vegetation age class and fuel structure across the landscape that will be more resilient to disturbance over time. The implementation of vegetative treatments by mechanical, hand and or prescribed fire actions across portions of the landscape will provide additional diversity in age classes, species, and reduce conifer encroachment in natural meadow openings. The project is designed to meet ecological productivity along with economic and social goals for the Castle Mountains. These actions will meet goals of reducing the probability of post-wildfire watershed impacts to the Willow Creek municipal watershed and associated costs.

Range of Alternatives:

Alternative 1: The existing condition would remain. No treatment action would be implemented on the Castles landscape. Only ongoing uses, permitted activities and natural processes would continue. This is the baseline condition and would be used for comparison of effects. This alternative would not fully meet the purpose and need.

Alternative 2: The Proposed Action to meet restoration objectives across the landscape using a variety of management tools and treatment types. This alternative would require temporary road construction to mechanically treat the most acres across the landscape to meet desired conditions. The alternative would provide commercial wood products. The wildlife analysis for this alternative will include a site specific Forest Plan Amendment for 2 standards.

Alternative 3: An action alternative that meets restoration objectives across the landscape using a variety of management tools and treatment types that would optimize a variety of wildlife habitat across the landscape. The design of this alternative puts emphasis on maintaining effective big game travel corridors, suitable lynx habitat areas, maintains open meadows and natural parks, promotes whitebark pine and aspen regeneration. Prescribed fire would be utilized to mimic natural process as a standalone treatment as well as in conjunction with other treatments. This alternative would provide a level of commercial wood products and is responsive to several scoping comments including harvest opening sizes, temporary roads, water quality and big game security. The wildlife analysis for this alternative would include a site specific Forest Plan Amendment for 2 standards.

Alternative 4: An action alternative that was requested in scoping comments to consider only treatments that would not require a forest plan exception (amendment) to any standards. This alternative would only treat a limited number of acres primarily on the west side of the analysis area and would not meet the desired restoration objective across the landscape. This alternative has been developed and considered but would not be analyzed in detail as it would not meet the project purpose and need for landscape level restoration.

Alternative 5: Preferred Alternative is an action alternative that meets restoration objectives that was developed to respond to several comments relating to fuels concerns adjacent to private lands and the alternative ensures operational feasibility during implementation. This alternative contains the addition of two (new) prescribed fire units in Hall Creek, as well as one aspen enhancement and the two lodgepole regeneration units analyzed under Alternative 3 in Hall Creek. Unit boundary alterations in several previously analyzed units were done within the existing treatment footprint. Stand Improvement treatments are being displayed for non-commercial and commercial. No harvest would occur in the IRA and ownership alignment was completed based on an updated state land ownership layer. The wildlife analysis for this alternative would include the site specific Forest Plan Amendment for 2 standards.

Site Specific Plan Amendment for two (2) standards:

- The first standard which needs exempting is Management Standard C-1 (5) which requires that drainages containing identified summer/fall elk range be maintained at 30 percent or greater effective hiding cover (as defined in the Forest Plan).
- The second standard which needs exempting is the standard from Management Direction for Management Area C lands that requires maintenance of effective hiding cover percentages by timber compartment at an average of 40 percent with a minimum of 35 percent for any individual sub-compartment. Of the 24 watersheds that contain summer/fall range, 14 are currently below the standard and 5 are so close to the standards that any treatment that removes cover (harvest or burning) would be precluded. This amendment would allow the Forest to reduce hiding cover below the plan standards to meet project objectives for this project only.

Overview of Issues Addressed

Sensitive species are species identified by the Regional Forester for which population viability is currently of concern, as evidenced by significant current or predicted downward trends in population numbers or density, or by significant current or predicted downward trends in habitat capability that

would reduce a species' existing distribution (USFS 2005). The Forest Service has established direction in the Forest Service Manual (FSM) to guide habitat management for proposed, endangered, threatened, and sensitive plant species. The direction establishes the process, objectives, and standards for conducting a biological evaluation. This process ensures that these species receive full consideration in the decision making process. This report incorporates all the information required for a biological evaluation.

Issue Indicator

The following analysis indicator was used to measure the differences between alternatives:

Impacts to sensitive species and sensitive species habitat: Impacts to the sensitive plant species may be direct impacts, such as trampling, defoliation, and mechanical damage; or the impacts may be more indirect such as a change in the microclimate or a change in species composition, both of which may result in a loss of habitat. In general, direct impacts are short-term impacts, occurring immediately, while indirect impacts such as changes to the habitat occur over a longer timeframe.

Table 2. Sensitive plant resource indicators and units of measure

Resource Indicator	**Qualitative Units of Measure**	**Quantitative Units of Measure**
Abundance	Presence or absence	Number of occurrences, sub-populations and/or plants affected
Suitable Habitat	Presence or absence (based on habitat type and site conditions encountered during surveys)	Not applicable
Species Viability	Determination category	Not applicable

To accomplish this analysis, this report reviews the proposed action and alternatives in sufficient detail to determine the level of effect that would occur to each sensitive species evaluated. One of four possible determinations was chosen based on the best available scientific literature, a thorough analysis of the potential effects of the project, and the professional judgment of the botanist who completed the evaluation. The four possible determinations are as follows:

- No impact;
- May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species;
- Will impact individuals or habitat with a consequence that the action will contribute to a trend towards federal listing or cause a loss of viability to the population or species; or
- Beneficial impact.

Methodology

Spatial & Temporal Scale

The geographic analysis area for direct and indirect effects for this proposal is the project boundary. The project area is an appropriate size to assess the effects of proposed actions because all potential disturbances and effects to sensitive plants would occur within this boundary. When effects are determined, the cumulative effects analysis area is the Helena-Lewis and Clark National Forest, as effects on plant populations throughout the Forest are considered in determining potential impacts to the overall population.

This analysis assumes that the existing condition includes the effects of past actions. The analysis also considers the three viability scales that are typically used to determine species viability: population (element occurrence), metapopulation, and species distribution. The scale of viability concern for a given species depends on its distribution and abundance on the Forest (USFS 2004; Nature Serve 2002). In cases where a species' entire range is endemic to one National Forest, the entire species would be analyzed. On the other hand, if a species range is globally rare or a disjunct population, the metapopulation and/or populations would be evaluated to determine viability risk as a result of project activity. Known occurrences are considered forest-wide to determine if any detrimental impacts to sensitive species or habitat would contribute to a viability concern for the species in the plan area.

The temporal scale of this analysis considers effects 10 to 30 years into the future, which allows adequate time to observe changes in vegetation for the various plant forms (e.g. tree, forb, and moss). This amount of time reflects immediate effect of the prescribed fire on sensitive plants and the time needed for post-fire whitebark germination and seedling survival (Tomback et al. 1993).

Sources, Methods, and Assumptions

The effects analysis is based on known sensitive plant occurrences, as provided by the Montana Natural Heritage Program (MNHP 2018), the Lewis and Clark National Forest inventory of known plant populations (USFS 2018), and on potential habitat based on current site conditions. A preliminary analysis of the project area to determine potential habitat was conducted using information available from modeled habitat data, color aerial photography (National Agriculture Imagery Program), topographic and landtype maps, Region 1 Existing Vegetation Map Products (R1VMap – Version 12.1 and 14), Montana Natural Heritage Program field guides and geographic information system (GIS) coverages, and various GIS coverages (including an electronic version of the sensitive plant inventory) and analysis tools. Habitat requirements for each of the sensitive plant species were compared with habitat occurring in the analysis area using project-specific initial proposed action documents and GIS data and various corporate GIS data including roads, streams, and elevation. Field surveys of probable sensitive plant locations were conducted in 2013.

Affected Environment

Existing Condition

Forest Service sensitive species are defined as "[t]hose plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by: a) significant current or predicted downward trends in population numbers or density or b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution". Regional Foresters are delegated the authority to designate sensitive plant species based on the definition above (USFS 2005). The sensitive species list for the Northern Region was updated on February 25, 2011 (USFS 2011). There are currently 35 designated sensitive plant species that either occur or are suspected to occur on the Lewis

and Clark side of the Helena - Lewis and Clark National Forest. The list of sensitive species, their habitat requirements, and a determination to either include or exclude a plant from analysis is provided in Appendix A.

All Region 1 sensitive plant species potentially occurring on the Helena-Lewis and Clark National Forest were considered in this evaluation. There are no known occurrences of Region 1 sensitive species in the project area. Based on the pre-field review completed in 2012 (Davidson 2012), and surveys conducted in 2013 (USFS 2013; USFS 2017), habitat may exist in the Castles Mountain Restoration project area for twelve Region 1 sensitive species, short-styled columbine (*Aquilegia brevistyla*), upward-lobed moonwort (*Botrychium ascends*), peculiar moonwort (*Botrychium paradoxum*), small yellows ladies' slipper (*Cypripedium parviflorum*), northern wildrye (*Elymus innovatus*), northern rattle-snake plantain (*Goodyera repens*), Hall's rush (*Juncus hallii*), Missoula phlox (*Phlox kelseyi var missoulensis)*, whitebark pine (*Pinus albicaulis*), Austin's knotweed (*Polygonum austiniae*), and five-leaved cinquefoil (*Potentilla nivea var pentaphylla*).

Additional species were added to the Helena-Lewis and Clark National Forest sensitive plant list in 2016 based on new information (Consortium 2017; MNHP 2018). These changes are reflected in the current list in Appendix A. The new species are musk-root (*Adoxa moschatellina),* wavy moonwort *(Botrychium crenulatum),* creeping sedge (*Carex chordorrhiza),* glaucus beaked sedge *(Carex rostrata),* beaked spikerush *(Eleocharis rostellata),* Howell's gumweed (*Grindelia howellii),* storm saxifrage (*Micranthes tempestiva),* scorpidium moss *(Scorpidium scorpioides)* and California false-helleborne *(Veratrum californicum).* Musk-root, creeping sedge, Howell's gumweed, storm saxifrage, scorpidium moss, and California false-helleborne do not have potential habitat in the project area because the project is outside of these species' known range and these species will not be analyzed further in this report. Glaucus beaked sedge and beaked spikerush occur in specialized fen habitats (Lesica 2012; MNHP 2018) and potential habitat could occur in the project area. Any potential habitat for these species will be avoided during project activities with the watershed design criteria, therefore no impacts are expected. These species will not be analyzed further in this report. Wavy moonwort has potential habitat in the project area. Due to the similar habitat requirements this species has to upward-lobed moonwort and peculiar moonwort (Ahlenslager and Potash 2007), these three moonwort species' potential habitat overlaps in the project area and was surveyed in 2013 during botany surveys that targeted the two original moonwort species. Moonwort species are considered difficult to identify to species (Lesica 2012) and are often recorded as "Botrychium sp. (Species of Concern (SOC)/not SOC)" in Montana state records (MNHP 2018). Any moonworts discovered would have been documented in survey records in 2013, therefore this species' potential habitat has been surveyed and no moonwort populations are known to occur within the project area. This species will be carried forward in this report with upward-lobed moonwort and peculiar moonwort.

No other Region 1 sensitive species are expected to have potential habitat in the project area and therefore will not be discussed further in this document. (See Appendix A for suitable habitat descriptions for all Region 1 sensitive plant species found on or suspected to occur on the Lewis and Clark National Forest).

short-styled columbine (Aquilegia brevistyla)

Short-styled columbine typically grows in semi-open, moist drainage bottoms or toe slopes on alluvial or colluvial limestone substrates at mid-elevations (5000-6200') in the montane zone (Ladyman 2006, Roe 1992). Populations can also be located along streambanks. Partial overstory shade from conifers is a common component of occupied habitat. More open locations, such as meadow edges, can support low numbers of columbine if the plants receive shade from the adjacent overstory or topographic features (Ladyman 2006, Roe 1992). It is frequently found on calcareous soils and limestone rock outcrops. Short-styled columbine competes well with high understory canopy cover (Roe 1992). It is found from

eastern Alaska to Ontario, south to British Columbia and southern Manitoba. Disjunct populations are known form the Little Belt Mountains in Montana and the Black Hills in South Dakota and Wyoming (MNHP 2018). There are no known occurrences in the project area.

Across the species' range, the most immediate threat to short-styled columbine is habitat loss and modification of hydrologic conditions from recreation activities, livestock grazing, extraction of natural resources (minerals, timber), fire, fire suppression activities, and rural development (Ladyman 2006, Roe 1992). Modification of hydrologic conditions that maintain preferred mesic habitat also poses a potential threat to species survival (Ladyman 2006). On the Helena-Lewis and Clark, habitat loss and modification of hydrologic conditions would be most notable due to livestock grazing, timber harvest, fire, and fire suppression activities. Invasive weed establishment threatens individual plants and contributes to habitat degradation, especially when occurrences are adjacent to areas of recreation use or management activities. Herbicides used in the treatment of invasive weeds also present a risk to the species, although that risk is most often mitigated with proper training of the personnel applying the herbicide. Based on Ladyman's (2006) assessment of short-styled columbine in the Rocky Mountain Region, small, disjunct occurrences such as those in Montana are the most vulnerable to loss from threats described above and genetic loss through hybridization.

moonwort species (Botrychium ascendens, Botrychium crenulatum, Botrychium paradoxum)

Peculiar moonwort, wavy moonwort, and upward-lobed moonwort are small perennial ferns that produce two fertile segments with sporangia on a single stem each year. These species grow in a range of mesic habitats including meadows associated with lodgepole pine, spruce, shrubby cinquefoil, and willows and sites often contain several different species growing together. Moonworts can occur in pristine fen and wetland habitats, as well as in disturbed habitats along roadsides and relatively upland habitats with only seasonal waterflow. New plants can exist entirely underground for multiple years as the juvenile plants mature into reproductive individuals. It is also common for individual mature moonwort plants to remain dormant underground in a given year and produce no above ground leaf (Ahlenslager and Potash 2007).

Upward-lobed moonwort (*Botrychium ascendens*) is known from northwest to central Montana with two occurrences southeast of the Helena-Lewis and Clark National Forest in Park and Sweetwater counties. The only known occurrence on the Helena-Lewis and Clark National Forest occurs on the Rocky Mountain Front. Wavy moonwort (*Botrychium crenulatum*) is known from northwest Montana, with populations occurring south of the Helena-Lewis and Clark National Forest in Madison County and extending southeast into Wyoming. It is known on the Helena-Lewis and Clark National Forest from the Spotted Dog drainage west of the project area in the Divide area and on the Beaverhead-Deerlodge National Forest, immediately adjacent to the Helena-Lewis and Clark National Forest. Peculiar moonwort (*Botrychium paradoxum*) is known from northwest to south-central Montana. It occurs on the Helena-Lewis and Clark National Forest in the Spotted Dog drainage west of the project area and in multiple areas in the Rocky Mountain Front Ranger District.

There are no known moonwort occurrences in the project area. Habitat exists for all three species in the project area along stream bottoms, around seeps, in meadows, wet roadside swales, and moist roadsides/disturbed areas. Most occurrences in Montana are small in size and occupy roadsides or other similarly open or disturbed habitats. As such, it is vulnerable to activities such as weed invasion, weed spraying and road maintenance (MNHP 2018).

Some moonwort habitats, especially those created by human disturbances as well as fire, are considered to be ephemeral, and moonworts must colonize newly available habitats to stay ahead of successional changes (Zika et al. 1995). In addition, moonworts require endophytic mycorrhizae for at least a portion of their life cycle, and the presence or absence of this fungal associate probably plays a major role in the

initiation of new populations. Moonworts tend to occur in areas where some mineral soil is exposed or has been exposed within the last 10 -30 years. This probably has to do with the ability of arriving spores to percolate into the soil and perhaps also with the establishment and ecology of the appropriate mycorrhizal fungi. Management activities, including grazing, that maintain low to moderate levels of disturbance may also maintain moonwort populations (Ahlenslager and Potash 2007) and thus give some occurrences greater longevity. These species are susceptible to ground disturbance and hydrological changes.

small yellows ladies' slipper (Cypripedium parviflorum)

Small yellow ladies' slipper is a widespread, but sparsely occurring variety of *Cypripedium*. Although the species is found primarily in northwestern Montana, there are occurrences in central and south-central Montana (BONAP 2016; MNHP 2018). The largest populations on public land are on the Kootenai, Flathead, and especially the Rocky Mountain Front Range on the Helena - Lewis and Clark National Forest (Vanderhorst 1996). The Forest contains 12 yellow ladies' slipper occurrences in the North Fork Sun River area between Gibson Reservoir and the eastern Forest boundary, as well as a historical occurrence in the vicinity of Helena documented in 1891, which has not been relocated. Many times small yellow ladies' slipper grows together with sparrow's-egg ladies' slipper and round-leaved orchis (Vanderhorst 1996). This species grows along ecotonal margins of spruce habitat types (damp mossy woods) with wetland features, such as fens, seeps, springs, streamsides from the valley to lower montane zone (MNHP 2018; Vanderhorst 1996). According to Vanderhorst (1996), "this species has been found to grow in less typical habitats such as aspen stands, Douglas-fir habitat types, brushy river bottoms, willow stringers, and disturbed roadsides with other wet site plants." Habitat is generally associated with high water table features that provide stable, cool, groundwater discharge to meet the species moisture requirements (Vanderhorst 1996).

The greatest threat to population survival appears to be activities which impede or reduce groundwater flow at population sites (Vanderhorst 1996). Threats include hydrologic changes, microsites changes, disruption of underground associated mycorrhizal fungi and ground disturbance. This species is somewhat intolerant of livestock grazing and has minimal potential habitat within the project area outside of the protected SMZ's. Although small yellow ladies' slipper was not located during field surveys of the project area, there is a potential for suitable habitat to occur in the project area along stream bottoms, around seeps, in meadows and in mesic habitats. This species can exist outside of riparian buffers and threats include hydrologic and canopy cover changes.

northern wildrye (Elymus innovatus)

Northern wildrye is a perennial, native cool-season grass. This species is rhizomatous, but tends to form clumps primarily in sandy meadows, along stream banks, on rock hillsides with partial shade and in open stands of lodgepole or spruce (MNHP 2018). It occurs primarily in the upper montane on slopes adjoining the major valley bottoms. Northern wildrye seems ecologically equivalent to pinegrass (*Calamagrostis rubescens*) outside the range of the latter in areas where it is common, widespread, and abundant globally with a lack of vulnerability over most of its range. Northern wildrye can be found from Alaska, south to British Columbia, Alberta, Montana, Wyoming, and South Dakota (MNHP 2018; Nature Serve 2015).

This species is rare in Montana, where it is currently known from a few scattered sites east of the Continental Divide. Three of the ten known element occurrences are located in North Fork Birch Creek on the Helena-Lewis and Clark National Forest in Pondera County (MNHP 2018). The Helena-Lewis and Clark also supports three occurrences along Forest Road 839 which parallels Logging Creek in Cascade County. The remaining occurrences are in Glacier National Park (3 element occurrence) and along the Sun River north of Simms, Montana (1 element occurrence) (MNHP 2018). There are no

known occurrences of this species in the project area, and only a small area of potential habitat in the northeast corner of the project area.

This species is threatened by competition with nonnative grass species, such as timothy and Kentucky bluegrass. Where northern wildrye is a dominant species it may be grazed by wildlife and livestock, but it is not very palatable and has a moderate to low nutritional value (Williams 1990). Northern wildrye does not seem to be seriously injured by fire and may increase with burning. It is reportedly common in post-fire stands ranging from four to 100 years.

northern rattle-snake plantain (Goodyera repens)

Northern rattlesnake-plantain is common, widespread, and abundant globally with lack of vulnerability over most of its range. In Montana the species is at risk due to limited or very limited and/or potentially declining population numbers, range, and/or habitat with 143 Northern rattlesnake-plantain occurrences are located in Flathead, Fergus, Judith Basin, Meagher, and Wheatland counties (MNHP 2018; Nature Serve 2015). One occurrence occurs in Glacier National Park and the remaining 142 known occurrences are found on the Helena-Lewis and Clark National Forest in the Little Belt and Little Snowy Mountains.

Northern rattlesnake-plantain on the Helena-Lewis and Clark National Forest usually grows on cool, north-facing sites consisting of Engelmann spruce/twinflower or subalpine fir/twinflower habitat types with a well-developed organic duff and moss layer at mid-elevations (Achuff and Schassberger 1991; MNHP 2018; Phillips 1995). Plants are typically shallowly rooted in the thick organic layers. Northern rattlesnake-plantain prefers sites containing overstory shade provided by a late successional forest. Most populations are found on sites with limestone substrate, although plants have been found on shale and sandstone as well (Achuff and Schassberger 1991; Phillips 1995). The 1992 (Achuff) updated species status review noted that Northern rattlesnake-plantain's habitat was more restricted in the southern portion of the Little Belts compared to the northern portion. In the southern range, it is "associated narrowly with mesic north and east aspects, and narrow canyon bottoms, whereas in the northern part it occupies sites that are more exposed and in wider valleys" (Achuff 1992). It is assumed that the reason may be due to mesoclimatic differences. There are no known occurrences of northern rattle-snake plantain in the project area, but potential habitat is present.

Northern rattlesnake-plantain is detrimentally affected by activities that open the stand structure, remove overstory shade, or physically disturb or remove the forest floor organic matter. Timber harvest or severe stand-replacement wildfire are often associated with these detrimental effects (Achuff and Schassberger 1991). Observations of populations after disturbances in Sage Creek and the Judith River drainage indicated that Northern rattlesnake-plantain will extend up to the boundary, but not into recent clearcuts or severely burned forest (Achuff and Schassberger 1991). Known populations in the Dry Fork/Blankenship area on the Belt Creek Ranger District show plants to be established at least 90 feet away from the border of clearcut units completed in the 1970s and 1980s. However, Phillips (1991) found that rattlesnake-plantain can survive in shelterwood and selection harvest units or with low-severity surface fire that retains intact portions of the overstory shade and understory organic layer. As with other members of the Orchid family, rattlesnake-plantain relies on mycorrhizal fungi for growth and reproduction. It takes about five years for a rattlesnake-plantain seed to produce a rosette of evergreen leaves (Achuff and Schassberger 1991). Therefore, activities that impact the site's mycorrhizal fungi will impact rattlesnake-plantain. It is assumed that Northern rattlesnake-plantain has the ability to recolonize disturbed sites after suitable duff, moss, and shade develop. However, the recolonization phase is slow in arriving due to the time required for stand development. The youngest stand with known Northern rattlesnake-plantain populations was 80 years old (Achuff and Schassberger 1991).

Hall's rush (Juncus hallii)

Hall's rush typically grows in moist grasslands and sedge meadows from the montane to the alpine zone. It occurs on flats or benches on gentle mid to upper slopes with elevations between 4000 and 8400 feet (MNHP 2018; Poole and Heidel 1993). Occupied sites are generally classified as a rough fescue/Idaho fescue habitat type with a variety of soil parent materials, including limestone, shale, and quartzite. Although Hall's rush is able to grow and compete well in habitats with dense, relatively short herbaceous cover, it does not tolerate the shade of taller plants.

Hall's rush is known from 22 locations on the Helena-Lewis & Clark National Forest. This species is not known in the project area, though potential habitat is present. It is rare, though widespread across the mountainous portions of southwest and central Montana. Threats and potential negative impacts to most known occurrences appear to be minimal and the species is likely tolerant of some levels of disturbance (MNHP 2018). The Montana Natural Heritage Program has recently removed Hall's rush from their Species of Concern list, its status re-determined as low risk, low priority due to its occurrence in at least 15 subwatersheds, low threat levels, habitat trends that appear stable and overall low risk scores in all vulnerability factors. In the next revision of the Region 1 Sensitive Plants list, Hall's rush would likely be removed due to the number of populations that are now known in Montana, and lack of significant threats to its viability in the state (Shelley 2016, personal communication). Several of the recently collected occurrences on the Helena-Lewis and Clark National Forest have been on sites with past timber harvest, recent wildfire, and regular road maintenance which indicates that Hall's rush tolerates some level of disturbance.

Missoula phlox (Phlox kelseyi var missoulensis)

Missoula phlox is a low-growing perennial that inhabits gravelly windswept ridges and sometimes forb-dominated meadows on open, exposed limestone-derived slopes. Occupied sites span a wide altitudinal range, but are predominantly between 3600 and 8100 feet (MNHP 2018; Schassberger and Achuff 1991). This species is endemic to west-central Montana. There are eight occurrences known within the Castles Restoration project boundary. There are 21 occurrences found on the Helena, Townsend and Lincoln Ranger districts (covered under the Helena National Forest Plan), and 8 additional occurrences that occur in the Little Belts mountain range, bringing the total number of occurrences for Helena-Lewis and Clark National Forest to 29. As of February 2017, the Montana Natural Heritage Program database contained records of 24 occurrences in Montana that are not found on the Helena-Lewis and Clark National Forest.

Threats to this species include noxious weed spread, herbicide treatment, recreation, development, high intensity fire and fire management activities pose a threat, particularly to ridgeline populations. Missoula phlox, a slow growing perennial with a low recruitment rate, appears to be very intolerant of competition from other plants, especially overstory shade (Schassberger and Achuff 1991). Although there is no information concerning Missoula phlox's response to management actions, it does seem capable of occupying disturbed sites such as old roads and heavily grazed pastures (Schassberger and Achuff 1991). Invasive weed infestation, recreational activities, fire management activities and development are the most serious threats to Missoula phlox on the Helena-Lewis and Clark National Forest. Livestock trampling could pose a threat to populations, especially small ones. Livestock grazing does not appear to be an issue due to Missoula phlox's unpalatable woodiness and hard, pointed leaves (Schassberger and Achuff 1991). On the Helena-Lewis and Clark National Forest, known populations are adjacent to open system roads that have the potential for invasive weed establishment, exposure to herbicide use, and damage from road maintenance or off-road vehicle use.

whitebark pine (Pinus albicaulis)

Whitebark pine occurs in higher elevations throughout the Helena-Lewis & Clark National Forest. Whitebark pine is a keystone species because of its various roles in supporting community diversity and a foundation species for its roles in promoting community development and stability (Keane et al. 2012). Whitebark pine forests are declining across most of their range in North America because of the combined effects of mountain pine beetle outbreaks, fire exclusion policies and actions, and white pine blister rust. It can be promoted by removing competing conifers and creating suitable sites for regeneration.

"The decline of whitebark pine comes from a synergism of natural and human-driven causes. Periodic, massive outbreaks of mountain pine beetle, killing mature whitebark pines, have been exacerbated by suppression of natural fires. A major reduction in high-elevation fires since the early 1900's has led to successional replacement of whitebark pine on more productive sites in the part of its range where it otherwise should be abundant. White pine blister rust is killing whitebark pine trees in the intermountain region, coastal ranges, and Canadian Rocky Mountains, and rangewide mortality is expected within one to several decades." (Tomback et al. 2001, p. 13).

Whitebark pine is dependent on fire to maintain dominance and vigor. It is shade intolerant and susceptible to mountain pine beetle and the exotic disease white pine blister rust. The success of mountain pine beetle and white pine blister rust has been exacerbated by drought. See the Forest Vegetation report for more detailed descriptions of these mortality agents and the ecology of whitebark pine. On the Helena-Lewis & Clark National Forest, there is whitebark pine mortality from insects and disease, and evidence for the decline of this species is supported by recent Aerial Detection Survey reports and other whitebark pine monitoring. Again, see the Forested Vegetation report for further details.

Keane and others (2012) published A Range-Wide Restoration Strategy for Whitebark Pine (*Pinus albicaulis*), providing a comprehensive strategy for whitebark restoration. The strategy contains four principles:

1. Promote rust resistance, by a) supporting selective breeding programs to develop and deploy blister-rust resistant whitebark; b) facilitating and accelerating natural selection for rust resistant trees by reducing competition, providing openings for natural seed dispersal and seedling survival; and c) planting seedlings from trees known to have some level of resistance.
2. Conserve genetic diversity, by collecting and archiving seeds and growing and planting genetically diverse seedlings.
3. Saving seed sources, by protecting mature seed-producing resistant whitebark pine trees so that apparent rust-resistant seeds can be harvested in the future; and
4. Employing restoration treatments, by considering whitebark pine areas that are in decline for restoration treatments, including limiting the spread of blister rust, using fire to encourage regeneration, implementing silvicultural cuttings to reduce competition and increase vigor and reduce likelihood of MPB attacks, planting rust-resistant seedlings to accelerate the effects of selection, and promoting natural regeneration and diverse age class structures to maintain ecosystem function and reduce landscape level beetle hazard, and to provide large populations for selection for rust resistance.

Recommended actions relative to these principles include assessments, planning, reducing disturbance impacts, gathering seeds, growing seedlings, protecting seed sources, implementing treatments, planting seedlings, monitoring activities, and conducting research (Keane et al 2012).

Whitebark pine is an ecologically important forest type and where it occurs in the Castle Mountains because it represents a major source within the larger geographic area. The majority of whitebark pine occurs in the polesize (93%) with generally high stocking levels. The lack of large diameter sizes can be attributed to recent MPB activity. One stand visited with the largest diameter whitebark pine seen in the Castle Mountains sustained high loss to MPB. Continued MPB activity would result in a shift to the smallest size class, loss of overstory canopy cover, and accelerate succession to more shade tolerant type. Field reconnaissance observed moderate regeneration of whitebark pine with blister rust present. Given the seral nature of the stands, increasing competition from other species is likely. The trend would result in loss of whitebark pine to other species, namely subalpine fir. See veg report for additional details.

Austin's knotweed (Polygonum austiniae)

Austin knotweed is an annual species that is sparsely distributed in mountainous areas of Montana from the Rocky Mountain Front to the Madison and Gallatin Ranges. As of March 2017, the Montana Natural Heritage Program database contained records of 52 occurrences in Montana, with 11 occurrences of those on occurring on the Helena-Lewis & Clark National Forest. Most sites known on the Helena-Lewis and Clark National Forest occur in the Big Belts Mountains, with additional occurrences found in the Rocky Mountain Front. The probability of finding additional occurrences appears to be good, according to the Montana Natural Heritage Program (2018), since large areas of suitable habitat across western and central Montana remain unsurveyed for this species.

Throughout its range, Austin's knotweed is often associated with ponderosa pine and bluebunch (*Pseudoroegneria spicatum*) wheatgrass habitat types with little vegetative cover. In Montana, Austin's knotweed often grows in mountainous areas with soils derived from shale or in the shale itself, but is also found on limestone and mixed parent material (Barton and Crispin 2002). The shale substrates are mostly barren and are easily eroded, providing an early successional habitat in which some annuals are adapted. Populations are typically situated on south-facing slopes between 4300 and 8000 feet elevation, but can be found on all aspects (Vanderhorst and Heidel 1995). In addition to typical dry south facing aspects, Austin's knotweed was found in wooded to open meadows with subalpine fir and lodgepole, logged lodgepole stands, and along streams. There are no known occurrences in the project area.

The threats to Austin's knotweed viability are often low due to the nature of the common location on steep, sparsely-vegetated slopes with shale-derived soils and many sites are generally difficult to access with equipment and not impacted by human activity (MNHP 2018). Sites located along forest roads, such as those on the Helena-Lewis and Clark, are susceptible to weed invasion, noxious weed control, and other disturbances (MNHP 2018). Livestock trampling has been reported (Barton and Crispin 2002), but many known locations are too steep and rocky to be used by cattle. Phenology and population numbers of annuals often fluctuate drastically from year to year following climatic cycles (Vanderhorst and Heidel 1995).

five-leaved cinquefoil (Potentilla nivea var pentaphylla).

Five-leaf cinquefoil is ranked between being secure globally, although it may be rare in parts of its range, and/or suspected to be declining and being common, widespread, and abundant globally with lack of vulnerability over most of its range. In Montana the species is potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas. The Montana Natural Heritage Field Guide (2017) reports 21 five-leaf cinquefoil occurrences in Montana, with the majority in Glacier National Park. The Helena-Lewis and Clark contains one historic (1926) occurrence from Half Dome Mountain in the Badger-Two Medicine area (USFS 2017). The remaining populations are on the east side of Glacier National Park, in the Tobacco Root Mountains on the Beaverhead-Deerlodge National Forest, and on Electric Peak at the north edge of Yellowstone National Park on the Gallatin National Forest. Plant abundance noted at occurrences ranged from uncommon to common with

numbers ranging from less than 10 to 5000 or more. Based on field notes, occurrences may be larger than originally documented since some areas were too large to survey or surveys were limited to potential project areas. The probability of finding additional occurrences appears to be good since it has not been searched for extensively in suitable habitats in central and western Montana (MNHP 2018).

Five-leaf cinquefoil's preferred habitat is dry, shallow, gravelly soils or talus and scree of exposed ridges, slopes and summits in the montane to alpine zones ranging from 4600 to 10,000 feet (MNHP 2018). Its potential habitat in the project area occurs on ridge tops in gravelly soil. Threats to five-leaf cinquefoil in the project area may include trampling and noxious weed spread. This species' response to fire is unknown.

Environmental Consequences

The measurement indicators for sensitive species include abundance, suitable habitat and species viability. Abundance considers presence or absence, and if present the number of populations and/or plants that would be affected by project activities. Suitable habitat is also considered by presence or absence and this is based on habitat type, GIS analysis of aerial photos and topographic maps, and site conditions encountered during surveys. Species viability is qualitatively measured using the determination categories listed above. Species are evaluated at the appropriate level to determine impacts based on 1) species population, 2) metapopulation, and/or 3) species' entire range (USFS 2004).

Table 3. **Sensitive plant resource indicators and units of measure**

Resource Indicator	Qualitative Units of Measure	Quantitative Units of Measure
Abundance	Presence or absence	Number of occurrences, sub-populations and/or plants affected
Suitable Habitat	Presence or absence (based on habitat type and site conditions encountered during surveys)	Not applicable
Species Viability	Determination category	Not applicable

All Alternatives

Regardless of which alternative is chosen, some conditions and processes influencing sensitive plants would continue. Vegetation succession and natural disturbances would continue, with likely occurrences of events such as insect infestations, wildfire, flood, mass wasting, erosion, sedimentation, and storm damage (ice, wind throw, etc.).

The spread of noxious weeds has potential for adverse impacts on sensitive plant populations and habitats. Existing weed populations would continue to exist and expand, although control treatments would still occur and keep many populations in check. Noxious weeds can cause habitat degradation because they can out compete desired plant species for water, space, and nutrients. Noxious weeds can dominate plant communities and tend to form monocultures which negatively impact biological diversity. This weed competition to individual plants and communities can result in a loss of species diversity and effects to sensitive plants and their habitats. Even with continued weed control treatments, existing weed infestations would likely expand, especially in undocumented, inaccessible sites. Drift from herbicides

sprayed to help control weeds can also have detrimental effects to sensitive plants. This risk is reduced by adhering to label instructions for applying specific herbicides, and by application of measures in the Final Environmental Impact Statement and Record of Decision for the Lewis & Clark National Forest Weed Treatment Project that require a 100-foot buffer around sensitive plant species when applying herbicides (USFS 1994). Within this buffer, only hand-pulling of weeds would be allowed.

Mountain pine beetle infestations have compromised the lodgepole pine component of forested vegetation in the project area. Over time, the dead lodgepole fall and create pockets of heavy fuel loads. As a result, the potential for fire to occur in the project area exists, regardless of the chosen alternative, and the risk of stand replacing fire is increasing with the increasing fuel loads. See Fire Report for more information. The potential exists for wildfire to have a short-term adverse effect on sensitive plant habitats, but no long-term effects in most cases. Plant response to fire is a result of the interaction between severity of the fire and the individual plant species' inherent resistance to injury and ability to recover (Brown and Kapler Smith 2000). Mortality of herbaceous species is more dependent on the length of time plants are exposed to high heat, determined by the amount of duff and woody fuel consumed by the fire, than flame length and fire line intensity (Armour et al. 1984). The effect of wildfire on sensitive plant habitats therefore would depend on the weather, surface fuel conditions, and type of fire. The longer the amount of time fuels build up on the forest floor, the greater the potential damage to herbaceous sensitive plant habitats. Wildfires also risk enhancing noxious weed invasions if severe fires damage the native vegetation. Large stand-replacing fires are known to increase the risk of infestation by noxious weeds (D'Antonio 2000). Canada thistle, bull thistle, knapweeds, Dalmatian toadflax, and cheatgrass have been shown to increase following wildfire (Harrod and Reichard 2001). For species in specialized habitats (wet or, open exposed areas), wildfire effects would be considerably less. Wet habitats would continue to experience occasional flooding and movement of sediments.

Anthropogenic caused increases in temperatures and changes in precipitation are likely to impact both ecosystem structure and ecosystem processes (IPCC 2007). Climate controls many ecosystem processes including species distribution and abundance, regeneration, vegetation productivity and growth, and disturbance all of which could affect FS sensitive species on the Helena-Lewis & Clark National Forest. While there is some uncertainty regarding the scale, rate, and direction of future climatic conditions in the western United States and Montana some general observation regarding past changes and expected future changes, the majority of published science suggests that climate changes may strongly influence the frequency, intensity, and size of disturbances (such as fire and extensive insect outbreaks) in coming decades on areas of the Helena-Lewis and Clark National Forest. Changes in disturbance prompted by climate change are likely as important as incremental changes in temperature and precipitation for affecting ecosystem productivity and species composition. Recent research indicates that these risks may be particularly acute for forests of the Northern Rockies. Conservative future climate scenario models predict that the effects of climate change result in a growing season lengthened, the number of days with snow on the ground decreased, peak snow occurred earlier, and water stress increased for all sites in the study, which represent temperature and precipitation spectrum in the forests of the Rocky Mountain region (Boisvenue and Running 2010).

Increases in the severity of disturbances, combined with projected climatic changes, may limit habitat for FS sensitive species. Rare and uncommon species are expected to experience a number of barriers when adjusting to a rapidly changing climate because of the combination of a small number of occurrences, narrow elevation ranges, and requirements for specific soils types. Some of the FS Sensitive plant species with potential habitat in project area are restricted to limited areas within the forest. Warmer temperatures are expected to result in a change in the distribution of plants as the elevation at which plants are found shifts upward. This shift appears to be greater for species found in mountain habitats (Lenoir et al. 2008). Plants confined to outcrops of special soils are generally expected to have a far lower chance of

successful migration to suitable new sites and thus far greater risks of extinction in the face of climate change, than plants that are soil generalists (Harrison 2009). Because of the uncertainty in scale, direction, and rate of future climate change, current management of sensitive species on the Helena-Lewis and Clark National Forest focuses on maintaining viable populations throughout the species known range.

Historically large grasslands dominated the central portion of the project area. Missoula phlox, Austin's knotweed, and five-leaved cinquefoil occur in dry, open habitats. Moonwort species, small yellow ladies' slipper, northern wildrye, and Hall's rush can occur in mesic meadows. Grassland habitat in the project area is estimated to be at moderate departure from historic fire regime conditions. Currently most of these stands are showing an increase in conifer regeneration along the edges and in some cases scattered within the interior. There is also an increase in shrub cover. These areas with heavy conifer regeneration are now classified as smaller diameter conifer, resulting in a net reduction in grassland / shrub acres and consequently, reduction in potential habitat quality and availability for grassland species. In the continued absence of disturbance conifer regeneration would increase (NFMA report 2011). Mesic habitats, aspen stands and forested habitats which can provide habitat for Moonwort species, small yellow ladies' slipper, short-styled columbine and northern rattlesnake plantain continue to accumulate large woody debris from beetle-killed trees and the risk for a large stand replacing fire is increasing over time.

Aspen stands can provide potential habitat for short-styled columbine, moonwort species, small yellow ladies' slipper, northern wildrye, northern rattle-snake plantain, and Hall's rush. Aspen is rare in the project area, below the historical range of variation. Field reconnaissance throughout the project area indicated the aspen as seral to various conifer species, generally of the older age classes, with increasing competition from conifers, and insufficient aspen regeneration to serve as replacement. Most of the clones were less than 1 acre in size, with the exception of larger clones along Bonanza Creek adjacent to the forest boundary (NFMA Report 2011).

Alternative 1 – No Action

The existing condition would remain. No treatment action would be implemented on the Castles landscape. Only ongoing uses, permitted activities and natural processes would continue. This is the baseline condition and would be used for comparison of effects. This alternative would not fully meet the purpose and need.

Direct and Indirect Effects

The risk of direct impacts to known or undiscovered sensitive plant populations as a result of project activity would be eliminated. Noxious weeds spread would be reduced with this alternative. The risk of high intensity wildfire and fire suppression related habitat degradation that could negatively impact sensitive plant populations and habitat increases with this alternative.

Because there would be no management activities, implementation of the no-action alternative would have no direct or indirect effects on short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, small yellows ladies' slipper, northern wildrye, northern rattle-snake plantain, Hall's rush, Missoula phlox, Austin's knotweed, and five-leaved cinquefoil or these species' habitat. Sensitive plants would remain undisturbed except in the case of wildfire, the spread of noxious weeds, conifer encroachment or climate change impacts. Whitebark pine distribution in the project area is decreasing due to mortality from MPB and blister rust, as well as succession to other species**.** These trends would continue for whitebark pine in the project area and this species would not receive the expected beneficial impacts from the proposed whitebark pine restoration treatment proposed in all action alternatives.

Cumulative Effects for Alternative 1

Because there would be no direct or indirect effects, there would be no cumulative effects.

Alternative 2 – Proposed Action

This is the proposed action to meet restoration objectives across the landscape using a variety of management tools and treatment types. This alternative would require temporary road construction to mechanically treat the most acres across the landscape to meet desired conditions. The alternative would provide commercial wood products. The wildlife analysis for this alternative would include a site specific Forest Plan Amendment for 2 standards. Whitebark pine is the only sensitive species with known populations within the proposed treatment units. Several other species have potential habitat but no documented populations (Table 7).

Table 4. **Alternative 2 Proposed Treatments**

Treatment Type	Not in Inventoried Roadless Area	In Inventoried Roadless Area	Grand Total
Douglas-fir thinning	945.2	0	945.2
Regeneration Harvest	1,189.1	0	1,189.1
Meadow Restoration	6,759.9	1,910.3	8,670.4
Pre-Commercial Thinning	308.4	0	308.3
Aspen Restoration	269.3	53.6	322.9
Prescribed Fire	3,797.9	3,964.4	7,762.3
Stand Improvement Thinning	1,650.43	0	1,650.43
Whitebark Pine Restoration	11.8	844.6	856.4
Grand Total	**14,931.8**	**6,772.9**	**21,704.6**

Project Design Features and Mitigation Measures

Applies to all action alternatives, and in all treatment units.

- Survey areas of suitable habitat prior to implementation in units 410 and 411.
- To the extent possible whitebark pine trees of all size classes will be protected from damage. This may include ensuring that designated equipment trails avoid whitebark and trees are directionally felled away when possible.
- Generally, conifers within 10-20 feet of living whitebark pine will be cut.
- Whitebark pine will be protected from potential fire mortality in prescribed burning areas through techniques such as directional felling of trees away from whitebark, reducing fuel loads adjacent to whitebark by pulling slash away 10 to 20 feet depending on tree size, and designing ignition

patterns to limit fire intensity to whitebark individuals. Jackpot fuel piles will be arranged to avoid scorching whitebark trees in the vicinity and target seedlings and saplings of competing tree species, such as subalpine fir, where practical.

- If additional sensitive plant populations are located within the project area appropriate mitigation (e.g., site avoidance, avoid concentration of fuels on sites to be burned) would be followed upon consultation with a Forest Service botanist.
- No noxious weed herbicide treatment will be applied within a 100 foot buffer any sensitive plant population, in accordance with the Noxious Weed Forest Wide Environmental Impact Statement (USDA 1994). Within this buffer only hand-pulling of weeds would be allowed.
- Areas cleared of vegetation by project activities should be seeded with a blue-tag certified, native species seed mix approved by the Forest Botanist.
- In addition to Stream Management Zone rules, the following measures will be taken to protect isolated wet areas that are not adjacent to streams:
    - All wetlands, seeps, and springs should be identified and marked during project implementation.
    - Exclude equipment/trucks from wetland areas unless during winter conditions as specified in the Castle Mountain Restoration Project Soils Specialist Report.

Direct and Indirect Effects - Alternative 2

All action alternatives would involve ground disturbance from tree removal equipment and temporary road construction which has the potential to affect sensitive plant populations. The direct effects on sensitive plants would be similar for all action alternatives and include direct impacts such as mechanical damage, human trampling, and defoliation to any undiscovered occurrences, as well as increased risk of noxious weed infestation for all sensitive plant habitats. The action alternatives may impact still whitebark pine and any undiscovered sensitive species but that risk is greatly reduced by the design features and lack of known occurrences.

The potential for indirect effects to habitat caused by additional infestations and/or spread of noxious weeds would likely be higher in treatment areas due to the increase in disturbed areas available for colonization and movement of equipment, vehicles, and personnel, providing transport vectors for weeds. Several preventive and control measures would be implemented to reduce noxious weed impacts, including control treatment for known sites, weed-free requirements for equipment entering the project area, monitoring, and follow-up control treatment. Even though weed treatments would occur in the project area during and after implementation, there would likely be some infestations that remain undiscovered or otherwise escape treatment. Weed control treatments are rarely completely successful, and some infestations are likely to continue to persist and produce seed. These infestations have potential to affect or invade habitats for any of the sensitive species.

Wildfire risks (behavior and intensities) would be reduced with the action alternatives, varying by proximity to treatment units among other factors. Fire behavior modeling indicates that in all action alternatives, fuels reduction treatments reduce flame length and fire line intensity and contribute to the return of biophysical setting to its natural fire regime (Fuels Report, Project Record). Prescribed fire and pile burning after tree removal are proposed to reduce surface fuels. The use of prescribed fire would be expected to stimulate the growth of native understory vegetation over the long term (Armour et al. 1984). Prescribed fire treatments are likely to increase the overall understory native species richness (Dodson et al. 2008; McGlone et al. 2009) and percent cover, although non-native species may also be promoted if

allowed to spread into treated areas (McGlone et al. 2009). The sensitive species with potential habitat in the project area occupy grassland habitats benefit from regular fire to reduce tree encroachment and maintain plant communities. Antos and others (1983) have suggested prescribed fires at intervals of every 5 to 10 years for sites in western Montana for the project area's grassland habitats. Short-term conditions after burning, e.g., precipitation and cold-stress days, appear important in controlling species responses and composition of plant communities (Gross and Romo, 2009). Proposed treatments are expected to restore natural fire regime conditions and reverse the trends of these grassland areas transitioning to shrubland and timber lands, thus promoting forbs and perennial grass diversity (Fuels report, project record).

Short-styled columbine, small yellow ladies' slipper, Hall's rush occur in riparian and/or wetland habitats that would be buffered during project activity. These species are not currently known to occur in the project area and indirect impacts would be limited to minimal habitat outside of riparian buffers. Prescribed fire may creep into these species' habitat and the potential exists for wildfire to have a short-term adverse effect on sensitive plant habitats, but no long-term effects in most cases due to the low intensity fire expected.

Upward-lobed moonwort, wavy moonwort, and peculiar moonwort are not currently known to occur in the project area, but have potential habitat present. Because of their small size, moonwort species are easily overlooked, and these plants may be present even in areas that were previously surveyed. These species occur in mesic microhabitat habitats and depend on consistent hydrologic and canopy conditions to persist. If present, these moonwort species could be impacted by road reconstruction, maintenance or obliteration activities, weed introduction, and any changes in canopy cover in addition to ground disturbance and fire in treatment units. Wildfire at an occupied site could directly damage above-ground plant parts or kill the entire plants if enough heat penetrates into the soil (Ahlenslager and Potash 2007), however, wildfire could also create new areas of habitat which may be colonized and maintained until earlier successional stages are eventually passed (Zika et al. 1995). Successional changes to a closed canopy as a result of fire suppression, understory fuel build-up and conifer tree encroachment of meadow habitats generally reduces the amount of potential habitat for moonworts species. While undiscovered individuals maybe be negatively impacted, these species' potential habitat within the project area would be maintained and improved by the proposed action alternatives by creating more open conditions, and providing disturbance, thus possibly creating sites suitable for future colonization. Moonwort habitats on the larger landscape would continue their ephemeral nature, with individual occurrences becoming established in some locations (often as a result of disturbance) while others would succumb to successional changes as the overstory tree canopy continues to develop and/or expand.

Northern wildrye grows primarily in sandy meadows, along stream banks, on rock hillsides with partial shade and in open stands of lodgepole or spruce (MNHP 2018). This species has a limited amount of potential habitat in the project area. There is evidence that it is tolerant of fire and may increase with burning. It is reportedly common in post-fire stands ranging from four to 100 years. Any discovered occurrences would be protected with the appropriate design features if necessary.

Northern rattlesnake-plantain on the Lewis and Clark National Forest usually grows on cool, north-facing sites consisting of Engelmann spruce/twinflower or subalpine fir/twinflower habitat types with a well-developed organic duff and moss layer at mid-elevations (Achuff and Schassberger 1991; MNHP 2018; Phillips 1995). This species viability in Montana is vulnerable to disturbances that open the mature stand structure or remove the overstory canopy that creates suitable micro-sites for species survival. Detrimental disturbances include timber harvest, wildfire, road construction, or development (Achuff and Schassberger 1991; MNHP 2018; Phillips 1995). Any new populations discovered in the project area would be buffered from project activity to maintain microclimates and canopy cover for this species.

Habitats for Missoula phlox, Austin's knotweed, and five-leaved cinquefoil would be mostly unaffected by proposed activities. Many areas of affected habitat are small openings within treatment units (inclusions). Harvests and thinning treatments would be done in forested areas, and Missoula phlox and Austin's knotweed habitats are non-forested. Prescribed fire and tree removal along the edges of these openings would help to maintain these open habitats by setting back conifer encroachment. Undiscovered occurrences could be impacted by prescribed fire. In these openings, prescribed fire would likely burn quickly and with low severity through the grasses. In the less vegetated areas where Missoula phlox and Austin knotweed would likely occur, prescribed fire effects would be even less severe. Assuming a fire response similar to a closely related species, Hood's phlox (*Phlox hoodii*), Missoula phlox could be top-killed if burned over, but would likely survive and sprout new growth from its thick base or caudex (Gucker 2006). Austin knotweed is an annual plant, so top-kill would be fatal for the unlucky individuals, and this could decrease its seed production for that year. Adverse effects from prescribed fire would be short-term. Beneficial effects of prescribed fire include reduction of conifer encroachment into the openings and the renewal of nutrient cycling processes. Noxious weed invasion is likely the greatest threat for these habitats in the Castles Restoration Project area.

Whitebark pine would promoted in Alternative 2 by creating more open conditions, reducing shade-tolerant conifer competition, reducing susceptibility to insects, fire, and pathogens, creating sites suitable for re-establishment, and/or retaining live trees where available. Units which contain whitebark pine would be harvested to remove competing species and create post-disturbance conditions suitable for whitebark establishment. Treatments would remove competing conifer species, allowing whitebark to grow and establish new seedlings. Within treated areas on the appropriate habitat types, with the action alternatives whitebark pine is more likely to be retained and increased as a stand component. While the scale of this effect is relatively minor, the action alternatives would help to conserve whitebark genetics to the extent possible and ensure individuals are available for continued regeneration and natural selection processes into the future. Mechanical treatments could incidentally damage or kill some whitebark pines as tree removal equipment and personnel maneuver about the treatment areas. Some individual mortality can be expected in prescribed burn areas as well, but overall these restoration treatments re expected to improve vigor and encourage natural regeneration. In untreated areas, increased competition from other conifers would continue. Further details of anticipated effects to whitebark pine are described in the Vegetation report.

Cumulative Effects – Alternative 2

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Under the National Environmental Policy Act, "cumulative impacts" are the incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future federal, state, and private activities (40 CFR 1508.7).

The cumulative effects analysis area are the areas identified as potential habitat for sensitive species within the project area and known whitebark pine populations. Effects from this project outside of these areas are either minimal or cannot be tracked and defined.

Within this analysis area past, present and reasonably foreseeable future activities that have the potential to impact sensitive species include livestock grazing, timber harvest and thinning (fuels reduction), motorized and non-motorized recreational use, road and trail construction and maintenance, fire suppression, and prescribed fire. A list documenting past and planned future activities for the project area is included in Appendix B. For sensitive species there are policies in place that reduce or eliminate impacts from all these management activities. Because of these policies, the cumulative effects expected

from the alternatives proposed for this project, when combined with the effects from the other management activities, are not expected to contribute to any change in status or viability of sensitive species with potential habitat in the project area. Nor are the cumulative effects expected to contribute to an increase in any current or predicted downward trend in population numbers or habitat capability that would reduce the existing distribution of sensitive species, under any of the alternatives. This conclusion was reached by adding the direct and indirect effects disclosed earlier from the proposed activities to the following expected effects from these other management activities:

♦ Livestock grazing leads to biomass removal and trampling. It can cause changes in species composition, compaction of soils, and noxious weed invasion. Noxious weeds can be spread by grazing animals and weed seeds are transported into new areas. Through allotment management plans, any potential future impacts to sensitive plant populations by the trampling or grazing by livestock can be reduced, though impacts to sensitive species and habitats does occur, particularly in riparian habitats.

♦ Timber harvest and thinning (fuels reduction) has led to a more open canopy with additional light reaching the forest floor (which may be beneficial or detrimental depending on the site conditions), soil disturbance and compaction, development of skid roads, and noxious weed invasion. Changes in forest composition, structure and fire frequency have also taken place. It also increases the impacts from recreational activities by allowing improved access for those activities.

♦ Motorized and non-motorized recreational use has led to the development of non-system roads and trails, development of dispersed campsites, erosion, and the vectoring of noxious weeds in previously un-infested areas. These activities can lead to physical damage to plants and their habitats (biomass removal, vegetation compaction and ground disturbance). Vehicles and people help to spread noxious weeds by carrying weed seeds into new areas. These impacts are controllable through area closures and travel management. Sensitive plants could be impacted by recreational use; however there are travel management restrictions in place to help minimize these impacts.

♦ Road and trail construction and maintenance causes soil disturbance and erosion, fragmentation and destruction of habitat, and noxious weed invasion. It also increases the impacts from recreational activities by allowing improved access for those activities.

♦ Fire suppression has led to increased fuel loading, canopy closure, and higher intensity wildfire. Fire is a natural disturbance in the ecosystem. In some areas wildfires or controlled fires would create high ground temperatures that could sterilize the soil. Fire also tends to favor post-fire germination of non-native species in environments where non-natives are abundant and/or native species are stressed.

The actions and effects described above can be both additive and interactive to each other and to the direct and indirect effects described for the action alternatives. As stated earlier, because current management direction is designed to eliminate or reduce negative cumulative impacts by protecting sensitive plants from direct and indirect impacts, the cumulative effects to sensitive species, under both action alternatives, are expected to be minimal.

Alternative 3

An action alternative that meets restoration objectives across the landscape using a variety of management tools and treatment types that would optimize a variety of wildlife habitat across the landscape. The design of this alternative puts emphasis on maintaining effective big game travel corridors, suitable lynx habitat areas, maintains open meadows and natural parks, promotes whitebark pine and aspen regeneration. Prescribed fire would be utilized to mimic natural process as a standalone treatment as well

as in conjunction with other treatments. This alternative would provide a level of commercial wood products and is responsive to several scoping comments including harvest opening sizes, temporary roads, water quality and big game security. The wildlife analysis for this alternative would include a site specific Forest Plan Amendment for 2 standards.

Table 5. **Alternative 3 Proposed Treatments**

Treatment Type	NOT in Inventoried Roadless Area	IN Inventoried Roadless Area	TOTAL
Douglas-fir Thinning	768	0	768
Regeneration Harvest	376	0	376
Meadow Restoration	6653	1896	8549
Plant Shrubs	7	0	7
Pre-Commercial Thinning	286	0	286
Aspen Restoration	285	54	339
Prescribed Fire	3631	3110	6740
Stand Improvement Thinning	1161	0	1161
Whitebark Pine Restoration	12	845	856
Totals	**13177**	**5904**	**19082**

Design features and mitigation measures identified for Alternative 2 would also apply to Alternative 3. Whitebark pine is the only sensitive species with known populations within the proposed treatment units.

Under Alternative 3, treatments are similar with adjustments made to total acres for each treatment type and treatment locations. Whitebark pine restoration treatments are 856 acres – the same as Alternatives 2 and 4. All other treatment types are reduced to stay within current Forest Plan requirements. No sensitive plants, except whitebark pine, occur in the proposed unit for this alternative.

Direct and Indirect Effects

The direct and indirect effects from Alternative 3 are expected to be the same as those discussed for Alternative 2 except:

- There would be 2,622 fewer acres that would be treated. This would decrease the potential for direct impacts to undiscovered sensitive species and reduce the risk of indirect effects caused by habitat degradation from invasive species.
- 178 fewer Douglas-fir acres would be thinned and 814 fewer regeneration harvest acres would be treated. Limited sensitive plants habitat is found within these units due to the dense canopy and high percentage of beetle-killed trees in the habitat targeted for this treatments. No sensitive plant species occurrences are known within these units, but if any population is discovered it would be protected with the appropriate design criteria. Isolated pockets of potential habitat (e.g. riparian areas, open meadows) would generally be avoided during thinning treatments.
- 17 additional acres would be treated for aspen restoration. This treatment is expected to enhance potential habitat quality for short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, and small yellows ladies' slipper.
- 121 fewer acres would be treated for meadow restoration using hand, mechanical and prescribed fire. Hand and mechanical thinning to reduce conifer encroachment has the potential to have short-term impacts to undiscovered sensitive species, while maintaining potential habitat quality on the long-term. The reintroduction of fire into these areas is expected to benefit potential habitat for upward-lobed moonwort, wavy moonwort, peculiar moonwort, northern wildrye, Missoula phlox and Austin's knotweed.
- 1022 fewer acres would be treated using prescribed fire, reducing benefits to potential habitat for sensitive species.

Alternative 4

An action alternative that was requested in scoping comments to consider only treatments that would not require a forest plan exception (amendment) to any standards. This alternative would only treat a limited number of acres primarily on the west side of the analysis area and would not meet the desired restoration objective across the landscape. This alternative would not meet the project purpose and need for landscape level restoration.

Table 6. Alternative 4 proposed action

Treatment Type	Not in Inventoried Roadless Area	In Inventoried Roadless Area	Grand Total
Douglas-fir thinning	27.9	0	27.9
Regeneration Harvest	178.4	0	178.4
Meadow Restoration	974.2	595.3	1,569.5
Aspen Restoration	10.7	53.6	64.3
Prescribed Fire	200.1	208.9	409.0
Stand Improvement Thinning	128.3	0	128.3
Whitebark Pine Restoration	11.8	844.6	856.4

Treatment Type	Not in Inventoried Roadless Area	In Inventoried Roadless Area	Grand Total
Grand Total	**1,531.4**	**1,702.3**	**3,233.7**

Design features and mitigation measures identified for Alternative 2 would also apply to Alternative 4. Whitebark pine is the only sensitive species with known populations within the proposed treatment units.

Under Alternative 4, the amount of areas that can be treated is greatly reduced. Whitebark pine restoration treatments are 856 acres – the same as Alternative 2 and 3. All other treatment types are reduced to stay within current Forest Plan requirements. No sensitive plants, except whitebark pine, occur in the proposed unit for this alternative. This alternative proposed 18,471 fewer acres of overall treatment. This would reduce the potential for the direct impacts to any undiscovered sensitive plant occurrence. This also reduces the indirect effect of habitat degradation from invasive species. This also would greatly reduce any beneficial effects expected for sensitive species habitat as a result of reduced conifer encroachment and prescribed fire.

Direct and Indirect Effects

The direct and indirect effects from Alternative 4 are expected to be the same as those discussed for Alternative 2 except:

- There would be no treatments in areas that would require a Forest Plan Amendment. This greatly reduces the number of acres treated and does not meet the purpose and need of the project to reduce the threat of high intensity wildfire. The risk of a high intensity wildfire and degradation to the potential habitat in the project area as a result of fire management activities remains high with this alternative.

- 917 fewer Douglas-fir acres would be thinned and 1012 fewer regeneration harvest acres would be treated. Limited sensitive plants habitat is found within these units due to the dense canopy and high percentage of beetle-killed trees in the habitat targeted for this treatments. No sensitive plant species occurrences are known within these units, but if any population is discovered it would be protected with the appropriate design criteria. Isolated pockets of potential habitat (e.g. riparian areas, open meadows) would generally be avoided during thinning treatments.

- 258 fewer acres would be treated for aspen restoration. This treatment is expected to enhance potential habitat quality for short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, and small yellows ladies' slipper. The benefits of this treatment would not occur under this alternative.

- 7101 fewer acres would be treated for meadow restoration using hand, mechanical and prescribed fire. Hand and mechanical thinning to reduce conifer encroachment has the potential to have short-term impacts to undiscovered sensitive species, while maintaining potential habitat quality on the long-term. The reintroduction of fire into these areas is expected to benefit potential habitat for upward-lobed moonwort, wavy moonwort, peculiar moonwort, northern wildrye, Missoula phlox and Austin's knotweed.

Alternative 5

Alternative 5 is an action alternative that meets restoration objectives that was developed to respond to several comments relating to fuels concerns adjacent to private lands and the alternative ensures operational feasibility during implementation. This alternative contains the addition of two (new) prescribed fire units in Hall Creek, as well as one aspen enhancement and the 2 lodgepole regeneration units analyzed under Alternative 3 in Hall Creek. Unit boundary alterations in several previously analyzed units were done within the existing treatment footprint. Stand Improvement treatments are being displayed for non-commercial and commercial. No harvest would occur in the IRA and ownership alignment was completed based on an updated state land ownership layer. The wildlife analysis for this alternative would include the site specific Forest Plan Amendment for 2 standards.

Table 7. Alternative 5 proposed action

Treatment Type	Not in Inventoried Roadless Area	In Inventoried Roadless Area	Grand Total
Douglas-fir thinning	1,114	0	1,114
Regeneration Harvest	1,155	0	1,155
Meadow Restoration	6,998	1,780	8,778
Plant Shrubs	7	0	7
Pre-commercial thinning	419	0	419
Aspen Restoration	273	13	286
Prescribed Fire	4,743	3,320	8,063
Stand Improvement Thinning	1758	41	1799
Whitebark Pine Restoration	83	845	927
Grand Total	**16,552**	**5,999**	**22,551**

Design features and mitigation measures identified for Alternative 2 would also apply to Alternative 5. Whitebark pine is the only sensitive species with known populations within the proposed treatment units.

Under Alternative 5, treatments are similar with adjustments made to total acres for each treatment type and treatment locations. Whitebark pine restoration treatments are 927 acres – slightly increased from the other action alternatives. All other treatment types are reduced to stay within current Forest Plan requirements. No sensitive plants, except whitebark pine, occur in the proposed unit for this alternative.

Direct and Indirect Effects

The direct and indirect effects from Alternative 5 are expected to be the same as those discussed for Alternative 2 except:

- There would be an additional 847 acres that would be treated. This would increase the potential for direct impacts to undiscovered sensitive species and the indirect effect of habitat degradation from invasive species.

- 169 additional Douglas-fir acres would be thinned and 34 fewer regeneration harvest acres would be treated. Limited sensitive plants habitat is found within these units due to the dense canopy and high percentage of beetle-killed trees in the habitat targeted for this treatments. No sensitive plant species occurrences are known within these units, but if any population is discovered it would be protected with the appropriate design criteria. Isolated pockets of potential habitat (e.g. riparian areas, open meadows) would generally be avoided during thinning treatments.

- 36 fewer acres would be treated for aspen restoration. This treatment is expected to enhance potential habitat quality for short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, and small yellows ladies' slipper.

- 108 additional acres would be treated for meadow restoration using hand, mechanical and prescribed fire. Hand and mechanical thinning to reduce conifer encroachment has the potential to have short-term impacts to undiscovered sensitive species, while maintaining potential habitat quality on the long-term. The reintroduction of fire into these areas is expected to benefit potential habitat for upward-lobed moonwort, wavy moonwort, peculiar moonwort, northern wildrye, Missoula phlox and Austin's knotweed.

- 301 additional acres would be treated using prescribed fire.

Forest Plan Site Specific Amendments

Two Forest Plan site specific amendments are being considered for alternatives 2, 3 and 5 of the proposed action.

Site Specific Plan Amendment for two (2) standards:

- The first standard which needs exempting is Management Standard C-1 (5) which requires that drainages containing identified summer/fall elk range be maintained at 30 percent or greater effective hiding cover (as defined in the Forest Plan).
- The second standard which needs exempting is the standard from Management Direction for Management Area C lands that requires maintenance of effective hiding cover percentages by timber compartment at an average of 40 percent with a minimum of 35 percent for any individual sub-compartment. Of the 24 watersheds that contain summer/fall range, 14 are currently below the standard and 5 are so close to the standards that any treatment that removes cover (harvest or burning) would be precluded. This amendment would allow the Forest to reduce hiding cover below the plan standards to meet project objectives for this project only.

Impacts to Sensitive Plants

The two forest plant site specific amendments would not impact sensitive plants species. No sensitive plants are known to occur within the project area, except whitebark pine. In areas where additional sensitive plants are found the appropriate design criteria would be used to mitigate impacts (such as, retain existing canopy cover in areas where species dependent on canopy cover occur). Whitebark is expected to benefit from the proposed treatments.

Summary (Determination of Effects)

Federally Listed Plants

Due to the lack of federally listed plant species within the Castles Restoration Project area, and on the Forest in general, implementation of any of the proposed alternatives would have no impacts on listed plants.

Forest Service Sensitive Plants

No Action Alternative

Alternative 1, the No Action alternative, would have no new soil-disturbing activities that would disturb sensitive plant populations.

Determination

Candidate Species: Whitebark Pine (*Pinus albicaulis*)
Direct, Indirect, and Cumulative Effects of No Action Alternative

Whitebark pine is known from higher elevations (above 7000 feet) across the Forest and occurs on approximately 4% of the project area. This species is expected to benefit from the proposed action alternatives, and would not receive those benefits with the no action alternative. Please refer to the Forest Vegetation Specialist Report for specific details as to the specific effects on whitebark pine.

Determination: Alternative 1 ***may impact individuals but would not contribute toward a trend for federal listing or loss of viability*** for whitebark pine (*Pinus albicaulis*). The species is known from the analysis area, but design criteria as described in the Forest Vegetation Specialist Report would protect individuals and potential habitat.

Regional Forester's Sensitive Species:
Direct, Indirect, and Cumulative Effects of No Action Alternative

Determination: Alternative 1 would have ***no impacts*** on any Regional Forester's Sensitive Species (Table 10, Appendix A). This determination is based on the absence of any known occurrences and no new soil-disturbing activities.

All Action Alternatives

As stated, direct and indirect impacts to sensitive plants can result from implementing vegetation management projects.

Alternative 2, would have an intermediate amount of soil disturbance between alternatives 4 and 5, and therefore, an intermediate potential to affect sensitive plant populations and habitats with specific design criteria in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. For all action alternatives, the only sensitive species present within proposed treatment units is whitebark pine. No other sensitive species are known in the project area. Some individual whitebark pine (mainly seedlings or small saplings) may be damaged or killed in the activities, but the whitebark pine would benefit overall from the treatments. Whitebark pine habitat conditions would be improved by removing competing conifers and providing suitable conditions for survival and regeneration. Potential habitat quality for short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, and small yellows ladies' slipper, northern wildrye, Missoula phlox

and Austin's knotweed would be improved by the proposed meadow, prescribed fire and aspen treatments under this alternative and these species could potentially benefit from this alternative.

Alternative 3 would have an intermediate amount of soil disturbance between alternatives 4 and 5, and therefore, an intermediate potential to affect sensitive plant populations and habitats with specific design criteria in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. With specific design criteria in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. Although some adverse impacts are possible, whitebark pine, short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, and small yellows ladies' slipper, northern wildrye, Missoula phlox and Austin's knotweed would potentially benefit from this alternative, as described above for alternative 3.

Alternative 4 would have the lowest amount of soil-disturbing activities than alternative 2 and 3, and therefore a lower potential to affect sensitive plant populations and habitats. With specific design criteria in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. Although some adverse impacts are possible, whitebark pine, short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, and small yellows ladies' slipper, northern wildrye, Missoula phlox and Austin's knotweed would potentially benefit from this alternative, as described above for alternative 2. The benefit of these treatments would be greatly reduced for these species due to the reduced acreage in this alternative.

Alternative 5 would have the highest amount of soil-disturbing activities resulting in the greatest level of potential to affect sensitive plant populations and habitats. With specific design criteria in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. This alternative is expected to benefit habitat for whitebark pine, short-styled columbine, upward-lobed moonwort, wavy moonwort, peculiar moonwort, and small yellows ladies' slipper, northern wildrye, Missoula phlox and Austin's knotweed.

Determination

Candidate Species: Whitebark Pine (*Pinus albicaulis*)

Direct, Indirect, and Cumulative Effects of No Action Alternative

Whitebark pine is known from higher elevations (above 7000 feet) across the Forest and occurs on approximately 4% of the project area. This species is expected to benefit from the proposed action alternatives. Please refer to the Forest Vegetation Specialist Report for specific details as to the specific effects on whitebark pine.

Determination: Alternatives 2, 3, 4 and 5 ***may impact individuals but would not contribute toward a trend for federal listing or loss of viability***; and also is expected to have a ***beneficial impacts*** to the whitebark pine habitat in the project area overall. The species is known from the analysis area, but design criteria as described in the Forest Vegetation Specialist Report would protect individuals and potential habitat. The treatments are designed to enhance the long-term viability of this species.

Regional Forester's Sensitive Species

Determination: Alternatives 2, 3, 4 and 5 ***may impact individuals but would not contribute toward a trend for federal listing or loss of viability*** of short-styled columbine *(Aquilegia* brevistyla), upward-lobed moonwort *(Botrychium ascends),* wavy moonwort *(Botrychium crenulatum),* peculiar moonwort *(Botrychium paradoxum),* small yellows ladies' slipper *(Cypripedium parviflorum),* northern wildrye *(Elymus innovatus),* northern rattle-snake plantain *(Goodyera repens),* Hall's rush *(Juncus hallii),* Missoula phlox *(Phlox kelseyi var missoulensis),* Austin's knotweed *(Polygonum austiniae),* and five-

leaved cinquefoil *(Potentilla nivea var pentaphylla).* This determination is based on the presence of potential habitat for these species and the absence of any known occurrences

The remaining species without suitable habitat ***no impact***. These species and habitat are not known to occur or expected to occur within the project area (Table 10, Appendix A).

Summary of Environmental Effects

A comparison of sensitive plant indicators for each alternative is presented below.

Table 8. Summary of effects

Species	Alt 1 Risk	Alt 1 Determination	Alt 2 Risk	Alt 2 Determination	Alt 3 Risk	Alt 3 Determination	Alt 4 Risk	Alt 4 Determination	Alt 5 Risk	Alt 5 Determination
short-styled columbine *Aquilegia brevistyla*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
upward-lobed moonwort *Botrychium ascendens*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
wavy moonwort *Botrychium crenulatum*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	M May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.l	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
peculiar moonwort *Botrychium paradoxum*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards	low	May impact individuals or habitat, but will not likely contribute to a trend towards	low	May impact individuals or habitat, but will not likely contribute to a trend towards	low	May impact individuals or habitat, but will not likely contribute to a trend towards

Species	Alt 1 Risk	Alt 1 Determination	Alt 2 Risk	Alt 2 Determination	Alt 3 Risk	Alt 3 Determination	Alt 4 Risk	Alt 4 Determination	Alt 5 Risk	Alt 5 Determination
				federal listing or cause a loss of viability to the population or species.		federal listing or cause a loss of viability to the population or species.		federal listing or cause a loss of viability to the population or species.		federal listing or cause a loss of viability to the population or species.
small yellows ladies' slipper *Cypripedium parvaflorum*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
northern wildrye Elymus innovatus	very low	No Impact	very low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	very low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	very low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
northern rattle-snake plantain *Goodyera repens*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
Hall's rush *Juncus hallii*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Species	Alt 1 Risk	Alt 1 Determination	Alt 2 Risk	Alt 2 Determination	Alt 3 Risk	Alt 3 Determination	Alt 4 Risk	Alt 4 Determination	Alt 5 Risk	Alt 5 Determination
Missoula phlox Phlox kelseyi var. Missoulensis	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
Whitebark pine *Pinus albicaulis*	very low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species; Beneficial impact to individuals or habitat.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species; Beneficial impact to individuals or habitat.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species; Beneficial impact to individuals or habitat.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species. Beneficial impact to individuals or habitat.
Austin's knotweed *Polygonum austiniae*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.
five-leaved cinquefoil *Potentilla nivea var pentaphylla*	very low	No Impact	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.	low	May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Statutory and Regulatory Consistency

Table 9: Summary of Statutory and Regulatory Consistency

Regulatory Requirement	Project Consistency
Forest Service Manual – FSM 2670.32: (1) Review programs and activities as part of the National Environmental Policy Act of 1969 process through a biological evaluation to determine their potential effect on sensitive species. (2) Avoid or minimize impacts to species whose viability has been identified as a concern. (3) Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.	This report constitutes a biological evaluation for sensitive plant species. Although implementation of the project may cause incidental loss of whitebark pine seedlings and saplings, there would be an overall beneficial impact to the species within the project area. There are no other known occurrences of sensitive species in the project area; potential habitat exists for short-styled columbine (*Aquilegia brevistyla*), upward-lobed moonwort (*Botrychium ascendens*), peculiar moonwort (*Botrychium paradoxum*), small yellows ladies' slipper (*Cypripedium parviflorum*), northern wildrye (*Elymus innovatus*), northern rattle-snake plantain (*Goodyera repens*), Hall's rush (*Juncus hallii*), Missoula phlox (*Phlox kelseyi var missoulensis*), Austin's knotweed (*Polygonum austiniae*), and five-leaved cinquefoil (*Potentilla nivea var pentaphylla*). This project may impact individuals but would not contribute toward a trend for federal listing or loss of viability. Implementation of the project would have no impact upon the other designated sensitive plant species.
Forest Service Manual FSM 2672.41: Ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to trends toward Federal listing of any species.	Although implementation of the project may cause incidental loss of whitebark pine seedlings and saplings, there would be an overall beneficial impact to the species within the project area. There are no other known occurrences of sensitive species in the project area; potential habitat exists for short-styled columbine (*Aquilegia brevistyla*), upward-lobed moonwort (*Botrychium ascendens*), peculiar moonwort (*Botrychium paradoxum*), small yellows ladies' slipper (*Cypripedium parviflorum*), northern wildrye (*Elymus innovatus*), northern rattle-snake plantain (*Goodyera repens*), Hall's rush (*Juncus hallii*), Missoula phlox (*Phlox kelseyi var missoulensis*), Austin's knotweed (*Polygonum austiniae*), and five-leaved cinquefoil (*Potentilla nivea var pentaphylla*). This project may impact individuals but would not contribute toward a trend for federal listing or loss of viability. Implementation of the project would have no impact upon the other designated sensitive plant species.

Forest Plan Consistency

A table indicating this project's consistency with Forest Plan standards is available in the project record. Forest Plan standards of specific relevance are described below.

Table 10: Forest Plan Consistency for Sensitive Plant Resource

Forest Plan Standards for Sensitive Plants	Project Consistency
Management Standard C-2 (1): Comply with the Endangered Species Act, other related laws, executive orders, Forest Service Manual direction, implementing regulations of the National Forest Management Act, legal decisions that have a bearing on the Forest Service T&E species program, consultation with the US Fish and Wildlife Service, recovery plans, and special studies.	Standard does not apply. There are no listed threatened or endangered species on the Helena - Lewis and Clark National Forest. Three plants listed on the US Fish and Wildlife Service Endangered Species List as Threatened and occurring in Montana are water howellia (*Howellia aquatilis*), Spalding's catchfly (*Silene spaldingii*), and Ute ladies'-tresses (*Spiranthes diluvialis*) (USDI Fish and Wildlife Service 2016a; USDI Fish and Wildlife Service 2016b). Species occurrences and suitable habitat are only known on Forests west of the Continental Divide for water howellia and Spalding's catchfly and in the Missouri, Jefferson, Beaverhead, Ruby, and Madison River drainages for Ute ladies'-tresses. No analysis was conducted for the threatened species.
Management Standard C-2 (2): Conduct a biological evaluation of each program or activity which is Forest Service funded, authorized, or carried out on occupied T&E species and sensitive species habitat. This evaluation will determine whether or not informal or formal consultation with the US Fish and Wildlife Service on T&E species is appropriate.	This analysis constitutes the biological evaluation for proposed activities within the project area.
Management Standard C-2 (3): Identify and evaluate cumulative effects as part of each biological evaluation. This evaluation may result in specific management recommendations in addition to those identified above.	This analysis constitutes the biological evaluation for proposed activities within the project area. Direct, indirect, and cumulative effects of the proposed activities on sensitive plants are discussed in this analysis.
Management Standard C-2 (13): There are sensitive plants, as listed by the Regional Forester, of limited distribution that occur on the Forest and may require special consideration in land management to maintain diversity within the species gene pool. Assessments of suitable habitats for sensitive plants will be conducted before surface disturbing activities are permitted.	This report analyzes potential effects of proposed activities on designated sensitive plant species. Whitebark pine seedlings and saplings may be removed during project implementation, but the loss would not result in a trend toward federal listing or reduced population viability for whitebark pine or any of the other species with potential habitat in the project area (short-styled columbine (*Aquilegia brevistyla*), upward-lobed moonwort (*Botrychium ascendens*), peculiar moonwort (*Botrychium paradoxum*), small yellows ladies' slipper (*Cypripedium parviflorum*), northern wildrye (*Elymus innovatus*), northern rattle-snake plantain (*Goodyera repens*), Hall's rush (*Juncus hallii*), Missoula phlox (*Phlox kelseyi var missoulensis*), Austin's knotweed (*Polygonum austiniae*), and five-leaved cinquefoil (*Potentilla nivea var pentaphylla*)). The project would have no impact upon the remaining designated sensitive plant species for the Lewis and Clark side of the Helena – Lewis and Clark National Forest.

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Appendix A: Sensitive Species List

Table 11. Region 1 Forester's List of 35 Sensitive Species that occur or are suspected to occur on the Helena-Lewis & Clark National Forest

SPECIES	HABITAT	INCLUSION OR EXCLUSION FROM ANALYSIS
Adoxa moschatellina Musk-root	Vernally moist places in the mountains at the bottom of undisturbed, open rock slides that have cold air drainage.	Excluded from Analysis No known populations or appropriate habitat to support the plant
Amerorchis rotundifolia Round-leaved Orchis	Mossy seeps, sphagnum bogs, ponds, or along streams in wet to moist spruce forests with limestone-derived soils. 3350-5920foot elevation	Excluded from Analysis. This species restricted to the Rocky Mountain Front, Bob Marshall Wilderness Complex, Swan Valley, and the northwest corner of the state. Project is outside known range of the species and mostly above known elevation.
Aquilegia brevistyla Short-styled Columbine	Semi-open, moist drainage bottoms or toe slopes on alluvial or colluvial limestone substrates, at mid-elevation in the montane zone. Can be found along streambanks. Partial understory conifer shade is a common component. 5000-6200foot elevation	**Included in Analysis** Although this plant is known only in the Little Belt Mountains, the sensitive plant model predicts potential habitat in the eastern portion of the Castle Mountains. Habitat is not predicted in proposed activity areas, however there is still potential for habitat to exist in these areas.
Astragalus lackschewitzii Lackschewitz' Milkvetch	Generally restricted to open, gravelly and rocky slopes and ridgetops with calcareous soil and talus in alpine or subalpine zones. 7000-8120 foot elevation	Excluded from Analysis Known from high elevation sites on the Rocky Mountain Front. Project is outside known range of the species.
Botrychium ascendens Upward-lobed Moonwort	Stream floodplains of glaciated bottoms dominated by deciduous shrubs with lush cover by forbs, grasses, and mosses in NW Montana. Often associated with wetlands dominated by spruce and alder. Mostly found in subirrigated habitats 2700-6000 (up to 9500) foot elevation	**Included in Analysis** Restricted in Montana mostly to the northwest corner of the state. Known on the Helena-Lewis and Clark National Forest from one historic specimen collection in the Bob Marshall Wilderness in 1948.
Botrychium crenulatum Wavy Moonwort	Stream bottoms, around seeps, on the edges of marshes, and in wet roadside swales, often in soils influenced by precipitated calcium. Vegetation dominated by spruce, alders, and dogwood with high cover and diversity of forbs and graminoids. Reported from western red cedar habitat and also found in rough fescue/ID fescue grasslands in heavy litter, 2,400-7,700 foot elevation	**Included in Analysis** One population is known on the Helena-Lewis and Clark National Forest on the Helena Ranger District about 75 miles west of the project area. Potential habitat may occur in the project area.
Botrychium paradoxum Peculiar Moonwort	Mesic meadows and bunchgrass communities associated with spruce and lodgepole pine forests in the montane and subalpine zones. Grows on glaciated slopes and ridgetops, glaciated lake basins, and stream bottoms and draws. 2,400-9,500 feet elevation.	**Included in Analysis** Three populations are known on the Helena-Lewis and Clark National Forest, two in the northwest portion of the Forest and one population on the Helena Ranger District, about 75 miles west of the project area. Potential habitat may occur in the project area.
Carex chordorrhiza Creeping Sedge	Wet, organic soil of fens in the montane zone	Excluded from Analysis No known populations or appropriate habitat to support the plant. In Montana, this species is known only to occur in the northwest corner of the state. Project is outside the known range of the species.
Carex rostrata	Wet, organic soils of fens in the montane zone,	Excluded from Analysis

SPECIES	HABITAT	INCLUSION OR EXCLUSION FROM ANALYSIS
Glaucus Beaked Sedge	including floating peat mats.	Two populations known on the Helena-Lewis and Clark National Forest in the Little Belt Mountains, approximately 15 miles north of the project area. Activities would not occur within fen habitat
Cypripedium parviflorum Small Yellow Lady's Slipper	Along ecotonal margins of spruce habitat types (damp, mossy woods) with wetland features such as fens, seeps, springs, streamsides, and moist forest meadow ecotones in the valley to lower montane zones. Generally associated with high water table features that provide stable, cool groundwater discharge and cool, moist, calcareous soils 2500-6200 feet elevation.	**Included in Analysis** Most Montana populations are in the northwest corner of the state, but scattered occurrences surround the project area. Potential habitat could occur in the project area.
Cypripedium passerinum Sparrow's Egg Lady's Slipper	Moist, mossy, seepy areas, riparian zones, ecotonal margins of sphagnum bogs, often in full or partial shade of conifers. Preferred habitat is associated with spruce, but will associate with lodgepole. On the Lewis and Clark, found on calcareous substrates derived from the Madison Limestone Formation. Also associated with semi-permanent water seepage near the surface. 3000-5700 feet elevation.	Excluded from Analysis No known populations or appropriate habitat to support the plant. In Montana, this species is known only to occur in the northwest corner of the state. Project is outside the known range of the species.
Drosera anglica English Sundew	Sphagnum moss in wet, organic soils of fens and meadows in the montane zone. Commonly associated with open water, wetlands, or riparian systems.	Excluded from Analysis Known populations occur west of the Continent Divide. Activities would not occur within fen habitat.
Drosera linearis Slenderleaf Sundew	Wet, organic soil of nutrient-poor fens in the montane zone. Commonly associated with open water, wetlands, or riparian systems.	Excluded from Analysis Only know from four populations located in the Bob Marshall Wilderness (west of the Continental Divide) and Indian Meadows RNA. Activities would not occur within fen habitat.
Eleocharis rostellata Beaked Spikerush	Wet, often alkaline soils, associated with warm springs or fens in the valley and foothills zones. Grasslands and open ponderosa pine woodlands in the valley and foothills.	Excluded from Analysis Two known populations in the Little Belt Mountains and the Rocky Mountain Front. The closest location is approximately 23 miles northern of the project area. Activities would not occur within fen habitat.
Elymus innovatus Northern wildrye	Primarily sandy meadows, along stream banks, on rock hillsides with partial shade, and in open stands of lodgepole or spruce. Primarily in the upper montane zone on slopes adjoining the major valley bottoms. Also in well-drained alluvial benches in flood plains 4600 – 5200 foot elevation.	**Included in Analysis** No known populations, but potential habitat may occur below 6000 feet. Most of project is above the known elevation range for species. Nearest location is about 40 miles north of the project area. GIS model does not identify potential habitat in the Castle Mountains. In the project area, one small area may contain suitable habitat for northern wildrye.
Epipactis gigantea Giant Helleborne	Widely varied. One consistent requirement is a permanent source of thermally-influenced water at the root level. Stream banks, lake margins, fens with seeps and springs, shrub dominated wetland, and riparian areas 2500 – 6000 feet elevation.	Excluded from Analysis No known populations or appropriate habitat to support the plant.
Erigeron lackschewitzii Lackschewitz's fleabane	Grows exclusively in exposed alpine settings (gravelly talus) with water-retaining calcareous soil derived from a dolomite substrate, rock-covered surfaces impeding water loss from	Excluded from Analysis No known populations or appropriate habitat to support the plant.

SPECIES	HABITAT	INCLUSION OR EXCLUSION FROM ANALYSIS
	shallow soil beneath, exposed, windy sites (saddles, protruding outcrops, crests of updraft chutes), and areas with first snowmelt and late soil recharge above 6000 foot.	
Gentianopsis macounii Macoun's gentian	Wet, organic soil of calcareous fens or wet meadows with standing water in the valley and foothill zones 3500-5500 foot elevation.	Excluded from Analysis No known populations or appropriate habitat to support the plant. In Montana, this species is restricted the northwest corner of the state. Project is outside the known range of the species. Activities would not occur within fen habitat
Goodyera repens Nothern Rattlesnake-plantain	Cool, moist, north-facing sites consisting of spruce/ twinflower and subalpine fir/ twinflower habitat types with well-developed organic duff, moss layers at mid-elevations, and shade from late successional forests 5000-6800 feet elevation.	**Included in Analysis** Many occurrences in the Little Belt Mountains, with the nearest being about 10 miles north of the project area, even though the GIS model does not predict habitat in the Castle Mountains.
Grindelia howellii Howell's Gumweed	Vernally moist, lightly disturbed soil adjacent to ponds and marshes, as well as similar human-created habitats, such as roadsides and grazed pastures 3000-5500 feet elevation.	Excluded from Analysis No known populations or appropriate habitat to support the plant. Species has potential habitat on the Helena National Forest only – this species is not suspected to occur on the Lewis and Clark National Forest.
Juncus hallii *Hall's Rush*	Moist grassland and sedge meadows from the montane to alpine zones. Flats or benches on the gentle to mid-upper slopes (3500) 6000-8800 feet elevation.	**Included in Analysis** No known populations, but potential habitat may occur. The nearest occurrences are about 25 miles north and 20 miles west of the project area.
Lycopodium dendroideum Treelike clubmoss	Moist, coniferous forest in the valley and lower montane zones.	Excluded from Analysis No known populations or appropriate habitat to support the plant. Project is outside the known range of this species.
Micranthes tempestiva Storm Saxifrage	Vernally moist, open soil in meadows and on rock ledges in the subalpine and alpine zones 7500-9500 feet elevation.	Excluded from Analysis No known populations or appropriate habitat to support the plant. In Montana, this species is restricted the southwest corner of the state. Helena National Forest only – this species is not suspected to occur on the Lewis and Clark National Forest.
Oxytropis podocarpa Stalked-pod Lococweed	Gravelly ridges and slopes, often on limestone, and in the alpine zone. Populations are situated in basins or on steep slopes and ridges with limestone-derived soils, in the alpine zone 6500-8500 feet elevation.	Excluded from Analysis Restricted to a small area of the Rocky Mountain Front in a remote habitat. Project is outside the known range of this species.
Phlox kelseyi var missoulensis Missoula Phlox	Open, exposed, limestone-derived slopes in the foothills to exposed, windswept ridges in the subalpine zone 5800-8500 feet elevation	**Included in Analysis** This species occurs across the Forest, including known populations in the Little Belt Mountains. Potential habitat may occur in the project area.
Pinus albicaulis White-bark Pine	Tolerates poor soils, steep slopes, windy exposures, and tree-line environments. Often found on warm, dry exposures in subalpine and alpine habitats.	**Included in Analysis** Whitebark pine is known to occur in the Castle Mountains.
Polygonum. austiniae Austin's Knotweed	Open, gravelly, sparsely-vegetated (mostly barren or easily eroded) slopes with shale-derived soils. Associated with ponderosa and bluebunch wheatgrass habitat types with little vegetation cover 4000-9000 feet elevation.	**Included in Analysis** No known populations, but possible habitat in the project area. One population is located about 10 miles east of the project area. Habitat of sparse vegetation would not

SPECIES	HABITAT	INCLUSION OR EXCLUSION FROM ANALYSIS
		likely be effected by proposed units, but possible impacts from temp roads and fire line constriction.
Potamogeton obtusifolius Blunt-leaved pondweed	Shallow water of lakes, ponds, and sloughs and lotic streams in the valley, foothill, and montane zones.	Excluded from Analysis Activities would not occur in aquatic habitats. Project is outside known range of the species, and above known elevations.
Potentilla nivea var. pentaphylla Five-leaved cinquefoil	Dry, shallow, gravelly soil or talus and scree of exposed ridges, slopes, and summits in the montane to alpine zones 4600-10000 foot elevation.	**Included in Analysis** Not particularly likely, due to distance from known sites and scarcity of potential habitat in the project area, but it may occur in some exposed areas.
Salix barrattiana Barratt's willow	Alpine habitat, sessile catkins, and sticky twigs will distinguish this willow from other species. Leaves and mature female catkins are necessary for positive identification 6500 – 9500 foot elevation.	Excluded from Analysis Only populations known in Glacier National Park and Beartooth Mountains.
Schoenoplectus subterminalis Water Bulrush	Shallow (0.1 - 3.0 m / < 10 foot depth) open water and boggy margins of ponds, lakes, and sloughs at 0.1-3.0 m depth, in the valley, foothill, and montane zone. Stems float on the water's surface.	Excluded from Analysis Activities would not occur in open water habitats.
Scorpidium scorpioides *Scorpidium Moss*	Exposed or submerged rocks in rivers and streams. Also found on wet soil in calcareous seeps and fens, and soil in bogs, ponds, and other wetlands. Low elevations to 10,000 foot.	Excluded from Analysis Only population on the Helena-Lewis and Clark National Forest occurs in the Rocky Mountain Front. Project is outside known range of the species, and above known elevations. Activities would not occur in stream habitats.
Thalictrum alpinum Alpine Meadowrue	Typically moist meadows or stony slopes in montane and lower subalpine areas. Can occur on drier, upper portions of hummocks. Sometimes occurs along stream channels 4500-8500 feet elevation.	Excluded from Analysis Known populations occur in southwest Montana (Beaverhead County) in moist meadows. The Montana Natural Heritage Program predictive model for this species did not identify potential habitat near the project area.
Trichophorum cespitosum Tufted club-rush	Sphagnum-dominated fens and wet meadows in the montane to alpine zones. Rare in Montana— known from populations in the mountainous portions of western Montana 2500-9000 foot elevation.	Excluded from Analysis Known populations on non-federal, Pine Butte Swamp Nature Conservancy Preserve south of Teton River. Activities would not occur within fen habitat. Project area outside of known range of this species in Montana.
Veratrum californicum California False-helleborne	Wet meadows and streambanks in the montane and subalpine zones 5500-8000 feet elevation.	Excluded from Analysis Only populations known from a localized area in the southwestern corner of the state. No known populations or appropriate habitat to support the plant. Helena National Forest only – this species is not suspected to occur on the Lewis and Clark National Forest.

Appendix B: Cumulative Effects

Table 12. Past, present and reasonably foreseeable activities within or near the Castle Mountains Vegetation Project cumulative impact analysis area

Activity	Type/Description	Timing	Sensitive Plant Effects
Allotment Management, Permit Reissuance for 4 Pastures	Hereim Pasture Voldseth Pasture Rostad Pasture – IV Ranch Pasture	On going	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Allotment Management,	Cattle Grazing on pastures located both on and off of National Forest land.	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Little Belt Mountains Hazardous Tree Removal Project	Individual tree removal from roadsides to improve public safety where mountain pine beetle has resulted in tree mortality that exceeds normal maintenance capacity.	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Castle Mountain Ranch Diversion and Ditch	Special use permit for use and maintenance of an irrigation ditch and headgates on Daniels Creek for irrigation of private land.	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Fries Irrigation Ditch	Special use permit for use and maintenance of an irrigation ditch.	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Northwest Energy Communication	Special use permit for operation and maintenance of a communication site	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or

Activity	Type/Description	Timing	Sensitive Plant Effects
Site			individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Marlo TV Association Communication Site	Special use permit for operation and maintenance of a communication site.	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Voldseth Water Line	Special use permit for use and maintenance of water line	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species
Road Obliteration: Mizpah, Sheep South, Deadman	Decommission roads as described by the Little Belt, Castle, and North Half Crazy Mountains Travel Plan ROD using obliteration.	Mizpah completed 2011, Deadman completed 2013, Sheep South completed 2015.	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species
Flying S Ranch	Special Use Permit for a water transmission line from National Forest to private land for livestock watering.	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species
Miller Fuels Reduction	Salvage dead and dying lodgepole pine on in WUI.	Ongoing-planned 2017 completion	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species
Noxious Weed Treatment	Under 1994 ROD (includes roadside)	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.

Activity	Type/Description	Timing	Sensitive Plant Effects
Road & Trail routine Maintenance	Routine maintenance includes blading, brushing, culvert cleanout, etc. Use of Forest Roads varies by route and season.	Ongoing	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Personal use firewood cutting.	Dead and down material (by cord)	Ongoing	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a trend toward federal listing for any species.
Private Land Timber Sales	Road use permit for hauling timber from private land.	Expired October 2013	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Outfitter-Guide Special Use Permits	2 big game hunting permits 1 Rock climbing 1 Day use horseback riding in the east castles.	Ongoing	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Private road SUP	Road use	Ongoing	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Private road SUP	Road use	Ongoing	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Private road SUP	Road Use (City/Municipal)	Ongoing	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Private road SUP	Road Use	Authorized	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Private road SUP	Road use	Authorized	This activity could impact sensitive plant populations or habitats. This activity would not cause a trend toward federal listing for any species.
Project proposal	Fisheries/watershed/fuels: address stream pH levels related to high riparian fuel loads. Would include tree cutting (small scale salvage such as firewood/post etc.) and	Decision Memo issued 2016 (Implement 2017/2018).	This activity could impact sensitive plant populations or habitats. Known populations would be protected from disturbance, but some habitat or individuals could be impacted. This activity would not cause a

Activity	Type/Description	Timing	Sensitive Plant Effects
	post-harvest fuel treatments that would include jackpot burning. Project is under the exception's within the Inventoried Roadless Area.		trend toward federal listing for any species.

Table 13 Recent Past Activities related to Abandoned or Inactive Mine Reclamation or Mine Reclamation under Federal Superfund law (CERCLA)

Activity	Type/Description	Timing	Sensitive Plant Effects
Main Cumberland	State of Montana and private partnership to close a complex of multiple mines, mill, and other buildings	2001	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.
Cumberland-Hamilton Creek and west	Mine units closed: adits = 4 shafts = 4 pits=11 trenches=2 sheds = 2 total w/0 sheds = 23	Completed	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.
Blue Bull-Grande-Bonanza Creek	Mine Units Closed Shafts =3 Pits=6 Trenches =2 Total = 11	2001-2007	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.
Yankee Jim Ridge	Mine Units Closed Shafts =3 Pits=16 Trenches =1 Total = 20	2001-2007	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.
Blackhawk	Mine Units Closed Shafts =3 Pits=11 Trenches =4 Total = 18	2001-2007	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.
Cooper Creek	Mine Units Closed Adits = 2	2001-2007	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.

Table 14. **Cumulative Effects by Past Action Activity Type**

Activity Name	Type/Description	Timing	Sensitive Plant Effects
Robinson Checkerboard	Stand Clearcut 71 acres	Before 1970	The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations.
Guard Station, Robinson Checkerboard	Shelterwood Establishment Cut 14 acres Wildfire 20 acres	1970-1979	The effects of these disturbances are reflected in the existing condition of the current sensitive plant populations.
Robinson Checkerboard; Guard Station	Shelterwood Establishment Cut 206 acres Stand clear cut 93 acres Seed Tree Seed Cut 24 acres Plant trees 20 acres	1980-1989	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.
Robinson Checkerboard, Spring Creek, Fourmile, Middle North Fork Musselshell, Castles,	Stand Clearcut 16 acres Tree Release and Weed 5 acres Plant Trees 54 acres Pesticide Treatment – First & Retreatment 5 acres Underburn – Natural Fuels Range Improvement 370 acres	1990-1999	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.
Coates Pond, Stohr Creek, Sourdough Creek, Hensley, Robinson Checkerboard, Spring Creek, Fourmile, Middle North Fork Musselshell, Castles	Rearrangement of Fuels – Natural Fuels Lop/Scatter 827 acres Rearrangement of Fuels – Activity Fuels 25 acres Pre-commercial Thin 17acres Pesticide Treatment – First & Retreatment 87 acres Broadcast Burn - Natural	2000-2009	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.

Activity Name	Type/Description	Timing	Sensitive Plant Effects
	Fuel 285 acres Underburn – Natural Fuels Grassland 64 acres Underburn – Natural Fuels Range Improvement 611 acres Underburn – Natural Fuels Shrub/Grass 1136 acres		
Coates Pond, Stohr Creek, Sourdough Creek, Hensley, Robinson Checkerboard, Spring Creek, Fourmile, Middle North Fork Musselshell, Castles	Pesticide Treatment – First & Retreatment 298 acres Rearrangement of Fuels – Natural Fuels Lop/Scatter 426 acres	2010-Present	This project could have caused a minor impact to sensitive plants or their habitat. The project did not cause a trend toward federal listing of species.